SECTION 16709

COMMUNICATIONS CONDUIT

PART 1 GENERAL

1.01 DESCRIPTION

This specification sets forth the minimum requirements for furnishing and installing communications conduit.

1.02 UNIT PRICES

A. Measurement

This item will be measured by the linear foot of "Communications Conduit" installed. Each linear foot shall include: conduit (PVC and Rigid Steel), inner duct, tracer wire, pull tape, marking tape / posts and all incidentals. Conduit shall be measured horizontally along the surface from center of communications service box to center of communications service box or other terminating point. Risers shall be measured as the amount of conduit extending from the ground surface.

B. Payment

The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid for "Communications Conduit." The price shall be full compensation for furnishing and installing conduit; for trenching, boring, excavating, furnishing and placing backfill, replacing pavement structure, sod, riprap, curbs or other surfaces; for marking location of conduit (when required); for furnishing and installing all fittings, junction boxes, special radius sweeps, and expansion joints, conduit straps; and for all labor, tools, equipment and incidentals necessary to complete the work.

PART 2 PRODUCTS

2.01 MATERIALS

Provide new materials that comply with the details shown on the plans and the requirements of this specification.

A. Fiber Optic Cable Polyvinyl Chloride (PVC) Conduit

Conduit for fiber optic cable shall be Schedule 40 PVC conduit having a 4 inch internal diameter. Conduit shall terminate without bends if possible. Bends shall be rigid steel conduit; having a minimum radius of 10 times the nominal diameter of the conduit (30 degree maximum bends - 90 degree bends are prohibited). The exterior of the steel bends shall be double wrapped with 10-mil PVC tape.

PVC conduit shall be joined by solvent-weld method in accordance with the conduit manufacturer's recommendation. No reducer couplings shall be used unless specifically indicated on the drawings.

B. Inner duct

All PVC Conduit shall be installed with four (4) one inch (1") polyethylene inner ducts. These inner ducts shall be longitudinally grooved on both the inside and outside to facilitate pulling the inner duct into the conduit and pulling future fiber optic cable into the inner duct. One (1) inner duct shall be provided in each of the following colors: brown, blue, orange, and black. Three feet of the inner duct shall extend beyond the end of the conduit, and coiled inside of the communications service box.

C. Marking Tape / Posts

Underground marking tape will be used in all areas where trenching is utilized to install underground conduit. Use marking tape in conjunction with marking posts and marking discs.

The technical specifications of underground marking tape are identified below, along with applicable testing methods necessary to establish that a cable submitted for approval meets these specifications.

TEST PROPERTY	THRESHOLD SPECIFICATION	REQUIREMENTS
Standard Weight	ASTM D2103	20 lbs/100 feet
Thickness – Overall	ASTM D210	4 mil
3 in. Tensile Break – MD	ASTM D882	35 lbs/ft
3 in. Tensile Strength – MD	ASTM D882	4 kpsi
3 in. Tensile Break – TD	ASTM D882	38 lbs/ft
3 in. Tensile Strength – TD	ASTM 882	5 kpsi
Elongation – MD – MD	ASTM 882	530 %
Elongation – TD – TD	ASTM 882	660 %
Tear Strength	ASTM D2261	1.5 lbs/ft

Underground marking tape will be a 3-inch wide, tear resistant, corrosion resistant elastic PVC orange tape, imprinted with the legend "CITY OF HOUSTON BURIED CABLE – CALL TRAFFIC OPERATIONS @ 713-881-3172". This legend will be printed every three (3) feet in black letters.

Underground cable marking posts will be used everywhere feasible and practical in all areas where fiber optic cable is installed in underground conduit. This is the preferred method of marking, since it is very visible. Marking posts should be placed every 500 feet in urban area, and every 1000 feet in suburban areas, as well as at every intersection corner and every change in direction. Exception would be locations like downtown where all surfaces are paved, where discs would be more practical.

Use marking discs set in concrete or pavement where the use of marking posts is not feasible and practical, i.e., areas such as downtown where everything is paved and for aesthetics.

Technical specifications of underground marking posts are identified below.

- Line Markers will be made from ultraviolet-stabilized High Density Polyethylene (HDPE)
- Minimum 3-1/2" O.D. tubular design
- Text will be hot-stamped into the fittings with an extra u-v clear coat.
- Crossing casing vents will be used to help maintain atmosphere conditions.
- Line markers will require no maintenance after installation

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

A. General

Place conduit in accordance with the lines, grades, and details shown on the plans or as directed. Conduit shall be buried a minimum of 30 inches deep underground unless otherwise shown on the plans. Fit conduit terminations with bushings or bell ends.

Prior to installation of innerduct/cables, pull a spherical template of at least 75% of the inside diameter of the conduit/innerduct through the conduit/innerduct to ensure that it is free from obstruction. Cap or plug empty conduit places for future use.

Conduit shall have 30 degree sweeps into communications service boxes or cabinets. Conduit bends shall have a minimum radius of 18 inches.

Where existing surfacing is removed for placing conduit, repair by backfilling with material equal in composition and density to the surrounding areas. Immediately repair any damaged infrastructure including sidewalks, driveways, riprap, etc. to equivalent conditions prior to construction.

Any obstructions to the trenching / boring operation such as utilities, structures, sprinkler systems, etc. are to be protected from damage by the contractor during construction and until the work is completed. In the event of damage, the contractor shall be responsible for the repair / replacement at his expense with materials and methods which leave the damaged items in as good or better condition than original. Immediately after installation of conduit, backfill pits, excavation or trenches.

B. Trenching

Trenching shall be the preferred method of excavation unless specified otherwise in the plans. No trenching shall be allowed within 5 feet of a tree. Where the depth of conduit changes, the trench bottom shall have a slope of 3 / 1 (horizontal / vertical) to accommodate the depth change.

C. Boring / Jacking / Directional Drilling

When indicated on the plans, conduit crossing existing pavement shall be placed by jacking and boring methods. The boring and jacking method used shall be approved by the Engineer prior to commencing work.

Excavate suitable pits for conducting boring operations (clearly mark/protect excavation to avoid injury by public). Pits shall be kept 2 feet clear outside of the pavement edge. Install conduit so there is no interference with street operation or no structure is weakened or damaged.

Unless otherwise specified in the plans, the method and equipment used in jacking casing or pipe shall be optional with the contractor, provided that the proposed method is approved by the Engineer. Heavy duty jacks suitable for forcing pipe through the embankment shall be provided by the contractor. Uniform pressure shall be applied from all jacks. Pressure shall be transmitted evenly around the ring of the pipe through an approved jacking head.

Once boring / jacking operations have begun, the boring / jacking shall be continuous, without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.

Material excavated ahead of the pipe shall be removed through the pipe. Jetting will not be permitted except as approved by the Engineer. The diameter of the excavation shall conform as closely as practicable to the outside diameter and circumference of the pipe being jacked.

D. Tracer Wire

One No. 6 AWG Green, unspliced THW/XHHW wire shall be installed in each conduit. The Tracer Wire shall be pulled inside of the fiber optic conduit in the voids outside of the innerducts. Lubricants used in pulling the tracer wire shall be water soluble. A minimum of 5 feet of wire shall be coiled, and secured, in the communications service box. The ends of all tracer wire within a communications service box shall be connected to a common lug to allow for locating multiple segments of conduit run with one setup of the detection equipment.

E. Pull Tape

No pull ropes, twine, or pull strings will be used on this project for the purpose of installation. Further, if the plans and specifications indicate pull tape for future use do not substitute pull ropes, twine or pull strings for pull tape.

Pull tape will be prefabricated woven polyester tape made from low friction, high abrasion resistant yarns providing a low coefficient of friction. Pull tapes will be prelubricated. Pull tapes will be printed with sequential footage markings for accurate measurement. Pull tapes will be ½ inch wide and have a minimum tensile strength of 1,250 pounds.

F. Sealing

After installation of cables and wires the conduits shall be sealed / plugged with a suitable compound so as to prevent the entrance of moisture or gases.

G. Submittals

Manufacturers' cut sheets / specifications for all equipment proposed under these specifications shall be submitted to the City of Houston's Traffic Signal and Operations branch at Houston TranStar (713-881-3172) prior to construction.

END OF SECTION